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10/577,218	04/26/2006	Shoji Shiba	03500.518677	3411

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EXAMINER	
EOFF, ANCA	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/577,218	SHIBA ET AL.	
	Examiner	Art Unit	
	Anca Eoff	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04/26/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The foreign priority document JP 2004-190479 filed on June 28, 2004 was received and acknowledged. However, in order to benefit of the earlier filing date, a certified English translation is required.

2. Claims 1-20 are pending in the application.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraph of 35 U.S.C. 102 that forms the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Wheeler et al. (US Pg-Pub 2003/0059709).

With regard to claims 1 and 5-7, Wheeler et al. disclose a photoimageable composition comprising a branched binder polymer (par.0033). The branched polymers comprise difunctional branch-point monomers having the structure A-Z-B (par.0034) where A and B each include one or more polymerizable groups and Z includes one or more base cleavable groups (par.0035), preferably an anhydride group (-C(O)-O-(O)C-) (par.0038).

Wheeler et al. specifically disclose branched polymer binders comprising methacrylic anhydride and methyl methacrylate (see Examples A and B in table 2 in par.0076).

The photoimageable composition further comprises a photoactive component, such as photoacid generators (par.0048). Suitable photoacid generators are onium salts and halogenated triazines (par.0049).

With regard to claim 2, since the acrylic resin of Wheeler et al. comprises the same monomers as the instant application and, absent a record to prove the contrary, it is the examiner's position that the acrylic resin undergoes intramolecular cross-linking through the carboxylic anhydride structure (MPEP 2112).

With regard to claim 3, Wheeler et al. disclose that the anhydride groups are acid-cleavable groups (par.0038) so they are situated in the side chain of the polymeric binder.

With regard to claim 4, the methacrylic anhydride in the branched polymeric binder of Wheeler et al. is identical to the compound of formula (2) of the instant application, where R_3 and R_4 are methyl groups.

5. Claim 20 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ohkuma et al. (US Patent 6,455,112).

Claim 20 is a product-by-process claim. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product

was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (MPEP 2113)

With regard to claim 20, Okhuma et al. disclose an ink jet recording head comprising an ink flow path formed from a dissoluble resin on a substrate and having a cured epoxy resin as coating material (abstract).

On the substrate are disposed ink ejection energy generating elements, such as electrothermal converting elements or piezoelectric elements (column 8, lines 16-19) and an ink flow path and ink ejection outlets (equivalent to the ink discharge ports of the instant application) will be formed (column 8, lines 12-15).

It is the examiner's position that the ink jet recording head of Okhuma et al. is identical to the ink jet head of claim 20 of the instant application.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota et al. (US Pg-Pub 2004/0072107) in view of Wheeler et al. (US Pg-Pub 2003/0059709).

With regard to claim 8, Kubota et al. disclose that on a substrate (201), a positive-working resist layer is coated and baked (par.0066 and fig. 1A). The positive-

working resist layer is then irradiated with UV light through a mask (par.0066) and then is developed to form a mold pattern (3) (par.0068 and fig.1 B).

These steps are equivalent to the steps (1) and (2) and the mold pattern (3) is equivalent to the first pattern of the layer of the photosensitive resin composition of the instant application.

An anisotropic etching is performed from the rear surface of the silicon substrate to form a supply aperture (par.0072), which is equivalent with the "step of removing a part on the substrate" in step (3) of the instant application.

The mold pattern (3) formed by the positive-working resist is then irradiated by a ionizing radiation in order to decompose the crosslinked positive-working resist constituting the mold pattern (3) to a lower molecular weight, thereby enabling easy removal thereof (par.0074). These steps of irradiation and development are equivalent to the steps of exposure and development of the "second lithographic step" (step(3)) of the instant application.

The positive working resist composition of Kubota et al. comprises a carboxylic acid anhydride structure but Kubota et al. fail to disclose that a compound that generates an acid when irradiated with light (acid generator) is comprised in the resist composition.

Wheeler et al. disclose a photoimageable composition with improved stripping properties, said composition comprising a branched binder polymer (par.0033). The branched polymers comprise difunctional branch-point monomers having the structure A-Z-B (par.0034) where A and B each include one or more polymerizable groups and Z

includes one or more base cleavable groups (par.0035), preferably an anhydride group (-C(O)-O-(O)C-) (par.0038). Wheeler et al. specifically disclose branched polymer binders comprising methacrylic anhydride and methyl methacrylate (see Example A and B in table 2 in par.0076). The photoimageable composition further comprises a photoactive component, such as photoacid generators (par.0048). Suitable acid generators are onium salts and halogenated triazines (par.0049).

The resist composition surpringsingly provides both increased adhesion and improved stripping (par.0063).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use the resist composition of Wheeler et al. in the process of Kubota et al. in order to benefit of the good qualities of the resist composition of Wheeler et al. (increased adhesion and improved stripping/removal properties, par.0062-0063).

With regard to claim 9, Kubota et al. disclose that the exposure in the first lithographic step is performed in a region between 210 to 330 nm (par.0086) and the exposure in the second lithographic step is performed in a region between 210 to 330 nm (par.0096). The positive-working resist is decomposed at a wavelength of 270 nm or shorter (par.0085) so such a wavelength is preferred for the second lithographic step.

Based on the disclosure of Kubota et al. one of ordinary skill in the art at the time could experiment and perform the exposure in the first lithographic step at a wavelength longer than the wavelength of the exposure light in the second lithographic step.

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (MPEP 2144.05-II Optimization of Ranges)

With regard to claims 10-12, Kubota et al. further disclose that the developing liquid for the positive-working resist composition is a liquid containing a glycol ether having 6 or more carbon atoms, such as diethylene glycol monobutyl ether, a nitrogen-containing basic organic solvent, such as ethanolamine and morpholine and water (par.0062).

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okhuma et al. (US Patent 6,455, 112) in view of Wheeler et al. (US Pg-Pub 2003/0059709).

With regard to claim 13, Okhuma et al. disclose a method of producing an ink jet head, said method comprising the following steps:

- providing on a substrate the desired number of ink ejection energy generating systems such as electrothermal converting elements or piezoelectric elements (column 8, lines 16-19), equivalent to the "pressure generating elements for discharging the ink" of the instant application (as defined in specification, page 27, lines 23-25);

- applying a dissoluble resin on the substrate including the ink ejection energy generating elements, the dissoluble resin being a photosensitive material (column 8, lines 48-52), equivalent to step (1) of the instant application;

- patterning the dissoluble resist material layer to form the liquid flow path (column 9, lines 35-36), this patterning step being equivalent to the steps (2) and (3) of the instant application;

- forming a resin layer on the resist layer having the liquid flow path patterned (column 9, lines 35-36), this step being equivalent to the step (4) of forming an ink flow wall of the instant application;

- forming ink ejection outlets in the coating resin layer by use of oxygen plasma (column 10, lines 8-10), this step being equivalent to the step (5) of forming an ink discharge port of the instant application;

- dissolving the dissoluble resin forming the ink flow path pattern (column 10, lines 31-32), equivalent to step (6) of the instant application.

Ohkuma et al. disclose that the dissoluble resin can be a polymethacrylate but fail to disclose that the dissoluble resin comprises an acrylic resin having a carboxylic anhydride structure in the molecule and a photoacid generator, as required by the instant application.

Wheeler et al. disclose a photoimageable composition with improved stripping properties, said composition comprising a branched binder polymer (par.0033). The branched polymers comprise difunctional branch-point monomers having the structure A-Z-B (par.0034) where A and B each include one or more polymerizable groups and Z

includes one or more base cleavable groups (par.0035), preferably an anhydride group (-C(O)-O-(O)C-) (par.0038). Wheeler et al. specifically disclose branched polymer binders comprising methacrylic anhydride and methyl methacrylate (see Example A and B in table 2 in par.0076). The photoimageable composition further comprises a photoactive component, such as photoacid generators (par.0048). Suitable acid generators are onium salts and halogenated triazines (par.0049).

The resist composition surpringsingly provides both increased adhesion and improved stripping (par.0063).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use the resist composition of Wheeler et al. in the process of producing an inkjet head of Okhuma et al. in order to benefit of the good qualities of the resist composition of Wheeler et al. (increased adhesion and improved stripping/removal properties, par.0062-0063).

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota et al. (US Pg-Pub 2004/0070643) in view of Wheeler et al. (US Pg-Pub 2003/0059709).

With regard to claim 14, Kubota et al. disclose a method of producing a liquid discharge head (abstract), said method comprising the following steps:

- providing a substrate (201) with a desired number of liquid discharge energy generating elements (202) , such as an electrothermal transducer or piezoelectric element, equivalent to the pressure generating elements for discharging ink of the instant application (par.0097, fig. 10);

- applying a crosslinking positive resist layer (203) on the substrate (201) including the liquid discharge energy generating elements (202) (par.0103, fig.11), equivalent to step (1) of the instant application;

- applying a positive resist layer (204) on the thermal crosslinking positive resist layer (203) (par.0105, fig. 12), equivalent to the step (2) of the instant application;

- exposing the resist layer (204) through a photomask (205) on which a desired pattern is drawn (par.0106, fig. 13), equivalent to step (3) of the instant application;

- developing the positive resist layer (204) for pattern forming (par.0107, fig. 14), equivalent to step (4) of the instant application;

- subjecting the lower layer of resist (203) to patterning (exposure and development) (par.0108 and fig.15), equivalent to steps (5) and (6) of the instant application;

- coating a layer of a liquid channel structure material (207) on the patterned lower layer (203) and the upper layer (204), equivalent to step (7) of the instant application where the liquid channel structure material of Kubota et al. is equivalent to coating resin layer of the instant application;

- forming ink discharge ports (209) in the liquid channel structure material (207) (par.0111), equivalent to step (8) of the instant application ;

- radiating the liquid channel structure material (207) with a ionizing radiation and immersing the substrate (201) in developer to remove the mold resist (par.0114, fig.18), equivalent to the step (9) of the instant application.

However, Kubota et al. fail to disclose that the positive resist layer (204) comprises an acrylic resin with a carboxylic anhydride structure in the molecule and a photoacid generator as required by the instant application.

Wheeler et al. disclose a photoimageable composition with improved stripping properties, said composition comprising a branched binder polymer (par.0033). The branched polymers comprise difunctional branch-point monomers having the structure A-Z-B (par.0034) where A and B each include one or more polymerizable groups and Z includes one or more base cleavable groups (par.0035), preferably an anhydride group (-C(O)-O-(O)C-) (par.0038). Wheeler et al. specifically disclose branched polymer binders comprising methacrylic anhydride and methyl methacrylate (see Example A and B in table 2 in par.0076). The photoimageable composition further comprises a photoactive component, such as photoacid generators (par.0048). Suitable acid generators are onium salts and halogenated triazines (par.0049).

The resist composition surpringsingly provides both increased adhesion and improved stripping (par.0063).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use the resist composition of Wheeler et al. in the process of Kubota et al. in order to benefit of the good qualities of the resist composition of Wheeler et al. (increased adhesion and improved stripping/removal properties, par.0062-0063).

10. Claims 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota et al. (US Pg-Pub 2004/0072107) in view of Wheeler et al. (US Pg-Pub 2003/0059709).

With regard to claim 15, Kubota et al. disclose that on a substrate (201), a positive-working resist layer is coated and baked (par.0066 and fig. 1A). The substrate is silicon and comprises a heat generating element thereon(par.0065)/discharge energy generating element. This step is equivalent to step (1) of the instant application.

The positive-working resist layer is then irradiated with UV light through a mask (par.0066) and then is developed to form a mold pattern (3) (par.0068 and fig.1 B). This is equivalent to the step (2) and the mold pattern (3) is equivalent to the first ink flow pattern of the instant application.

A negative-working material is coated on the mold pattern 3 to form a material layer for liquid flow path (4) (par.0069) then the negative-working material is subjected to pattern exposure to form an ink discharge port (par.0071).These steps are equivalent to the steps (4) and (5), where the negative-working material layer is equivalent to the coating resin layer of the instant application.

An anisotropic etching is performed from the rear surface of the silicon substrate to form a supply aperture (par.0072), which is equivalent with the “step of removing a part on the substrate” of step (3) of the instant application.

The mold pattern (3) formed by the positive-working resist is then irradiated by a ionizing radiation in order to decompose the crosslinked positive-working resist constituting the mold pattern (3) to a lower molecular weight, thereby enabling easy

removal thereof (par.0074). These steps of irradiation and development are equivalent to the steps of exposure and development of the "second lithographic step" (step (3)) of the instant application.

The positive working resist composition of Kubota et al. comprises a carboxylic acid anhydride structure but Kubota et al. fail to disclose that a compound that generates an acid when irradiated with light (acid generator) is comprised in the resist composition.

Wheeler et al. disclose a photoimageable composition with improved stripping properties, said composition comprising a branched binder polymer (par.0033). The branched polymers comprise difunctional branch-point monomers having the structure A-Z-B (par.0034) where A and B each include one or more polymerizable groups and Z includes one or more base cleavable groups (par.0035), preferably an anhydride group (-C(O)-O-(O)C-) (par.0038). Wheeler et al. specifically disclose branched polymer binders comprising methacrylic anhydride and methyl methacrylate (see Example A and B in table 2 in par.0076). The photoimageable composition further comprises a photoactive component, such as photoacid generators (par.0048). Suitable acid generators are onium salts and halogenated triazines (par.0049).

The resist composition surpringsingly provides both increased adhesion and improved stripping (par.0063).

Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use the resist composition of Wheeler et al. in the process of Kubota et al. in order to benefit of the good qualities of the resist composition of

Wheeler et al. (increased adhesion and improved stripping/removal properties, par.0062-0063).

With regard to claim 16, Kubota et al. disclose that the exposure in the first lithographic step is performed in a region between 210 to 330 nm (par.0086) and the exposure in the second lithographic step is performed in a region between 210 to 330 nm (par.0096). The positive-working resist is decomposed at a wavelength of 270 nm or shorter (par.0085) so such a wavelength is preferred for the second lithographic step.

Based on the disclosure of Wheeler et al. one of ordinary skill in the art at the time could experiment and perform the exposure in the first lithographic step at a wavelength longer than the wavelength of the exposure light in the second lithographic step.

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (MPEP 2144.05-II Optimization of Ranges)

With regard to claims 17-19, Kubota et al. further disclose that the developing liquid for the positive-working resist composition is a liquid containing a glycol ether having 6 or more carbon atoms, such as diethylene glycol monobutyl ether, a nitrogen-

containing basic organic solvent, such as ethanolamine and morpholine and water (par.0062).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anca Eoff whose telephone number is 571-272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AE /AE/